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JEI  
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# T.R.E. REPORT

JEI/A  
6288

No. T 1692

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T.R.E. REPORT NO. T.1692  
3L/R22/SCC/GTH

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## SIMPLIFIED MODULATOR FOR COMPONENT TESTING

### Summary

It is frequently necessary to construct a modulator for the purpose of life-testing or factory-testing major items such as valves and networks. A straightforward system for use in these cases was devised. It contains no valves other than H.T. rectifiers and a Trigatron or open gap. The small number of components involved renders the unit readily serviceable, reliable and trouble-free.

### General Principles

The basic circuit is shown in Drawing No. ATR.70/775 Figure 1. A high voltage transformer is grounded at one end and the other end is attached to the network via a rectifier, arranged to charge the capacity negatively. The same transformer winding is likewise connected to a second rectifier in opposition with the first. This rectifier charges a small condenser C (100 to 500  $\mu\text{F}$ ) connected between the trigger electrode of a spark gap S and earth.

The spark gap S, which may be CV85, CV125 or CV100 according to voltage requirements, is used to discharge the network N into the load R. The sequence of operation is as follows. N is charged negatively during one half of the supply cycle and the negative charge is maintained. On the positive half-cycle of the supply the condenser C charges positively through a resistance R1 (about 1 m-ohm in value) to a value sufficient to break down the trigger-anode gap. The main charge in N thereafter discharges into the load R. The limiting resistance R1 is used to reduce the current through the trigger-anode-ground circuit to a reasonably low value. At the same time R1 is such that the time-constant CR1 does not prevent the rise of voltage of C from being nearly equal to that of the supply waveform. The resistance R2 across C is generally 10/20 times R1 in value and the time-constant CR2 is roughly equal to a quarter of the time of one cycle of the supply frequency. None of the values is critical, however, and a fairly extensive range of frequency can be tolerated on a given system arranged with the above principles in view.

The network N is charged to nearly the peak negative value of the secondary waveform. Likewise the condenser C may be charged to approximately the peak positive value (provided CR1 and R2 are properly chosen). It may be found desirable to have this positive value higher than is obtained from a single common winding though this depends on the characteristics of the gap. In such cases it is not difficult to extend the winding to give the extra voltage at a low current rating for triggering purposes.

### Operation as a Full-Wave Circuit

The mode of operation on full-wave output can be deduced from Figure 1 and Figure 2 of Drawing GTR70/814. The output pulse is always negative in this arrangement. The circuit constants were chosen for a supply of 50 c/s frequency (output repetition rate 100 pps). The positively charged network requires inversion of the gap V6 and the anode and trigger are connected by 20 M-ohms. The positive charging of the triggering condenser is effected through the blocking condenser of capacity .002  $\mu\text{F}$ . Thus 0.8 of the peak voltage E is available for breakdown of the trigger electrode. This fraction could be increased if desired by reducing the trigger capacity to less than 500  $\mu\text{F}$ .

### Change of Repetition Rate

This is only effected by altering the supply frequency. However it is usually desirable to maintain constant repetition rate and this is  
/automatically

automatically ensured. A 50 c/s source can be used at 50 or 100 pps. Generators of 400 and 500 c/s are available and aircraft generators may be used to cover ranges from 800 c/s to 2500 c/s. by changing gear-ratios. Thus frequencies separated by discrete steps may be made available and repetition rates from 50 to 5000 pps realised.

#### Typical Waveforms

The waveforms observed at various parts of the circuit are shown in Drawing ATR70/775, Fig.1, and Drg. GTR70/814, Fig.2, for half-wave and full-wave operation respectively. The last refers to operation at 100 pps. with a circuit operating on a 50 c/s input supply frequency. It will be noticed that there are slight differences observed in the pulse shapes obtained on the alternate cycles. It seems that these differences are due to the effects of stray capacities and inductances which are not exactly alike due to the asymmetry of components.

It should be noted that the circuit is of the hold-off type and deionisation difficulties are less marked. Higher repetition rates may be employed than with the constant current charging systems.

Authors: S.C. Curran  
G.T. Hawkins.

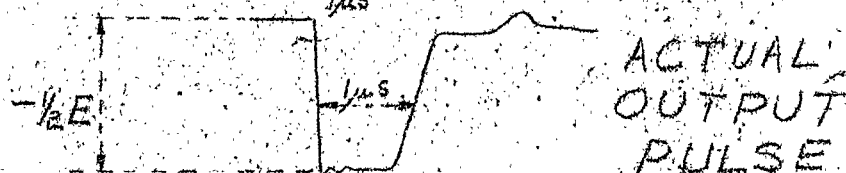
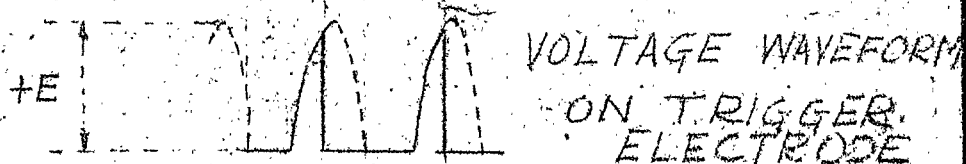
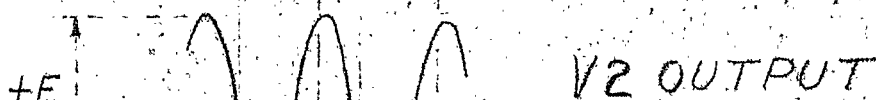
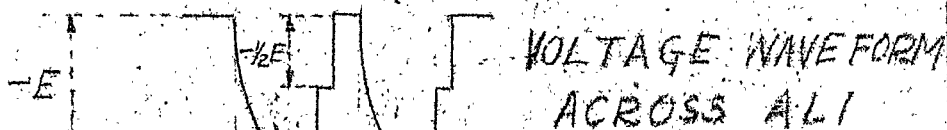
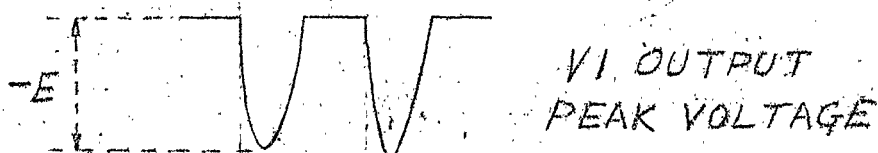
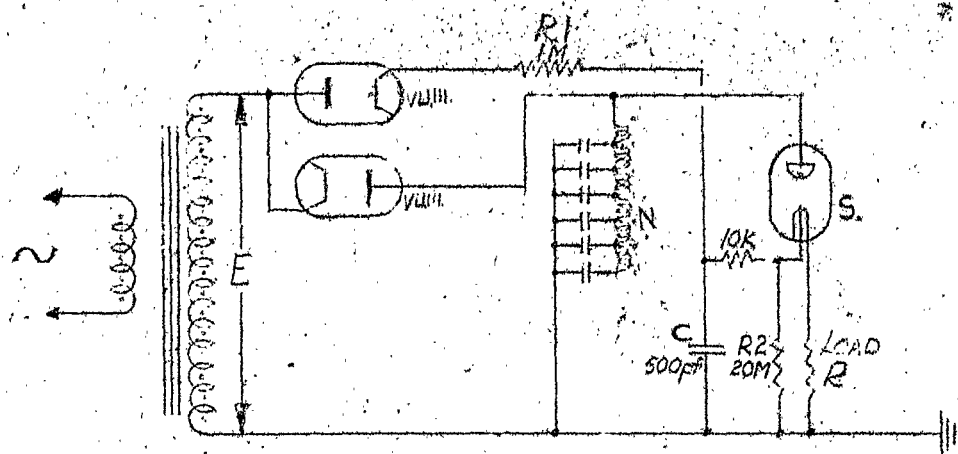
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19th June, 1944.  
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Numbered Pages: 2.

Drawings: ATR70/775  
GTR70/814.

S.No. 9087.



THIS DRAWING IS TO BE READ IN CONJUNCTION WITH SPEC D.C.D. WT.1000.

TITLE: A SIMPLE TRIGGERED  
SPARK GAP MODULATOR  
HALF WAVE OPERATION

T.R.E. MAP

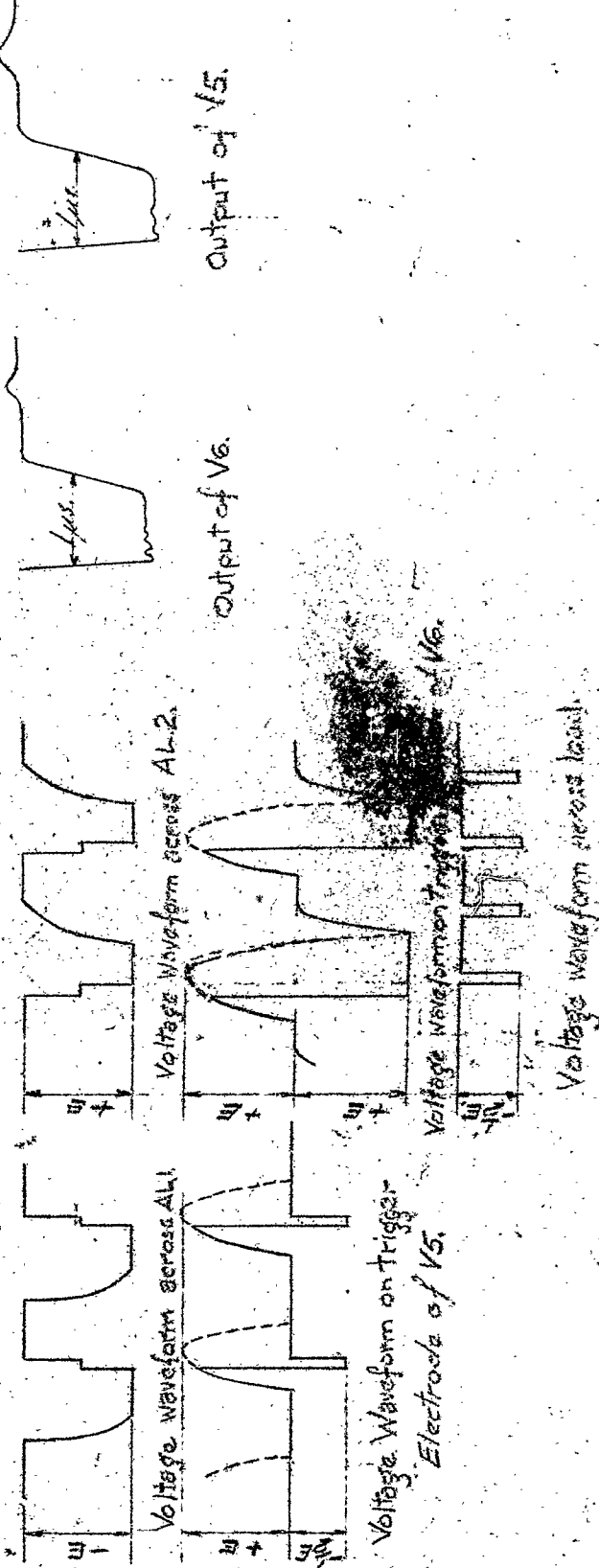
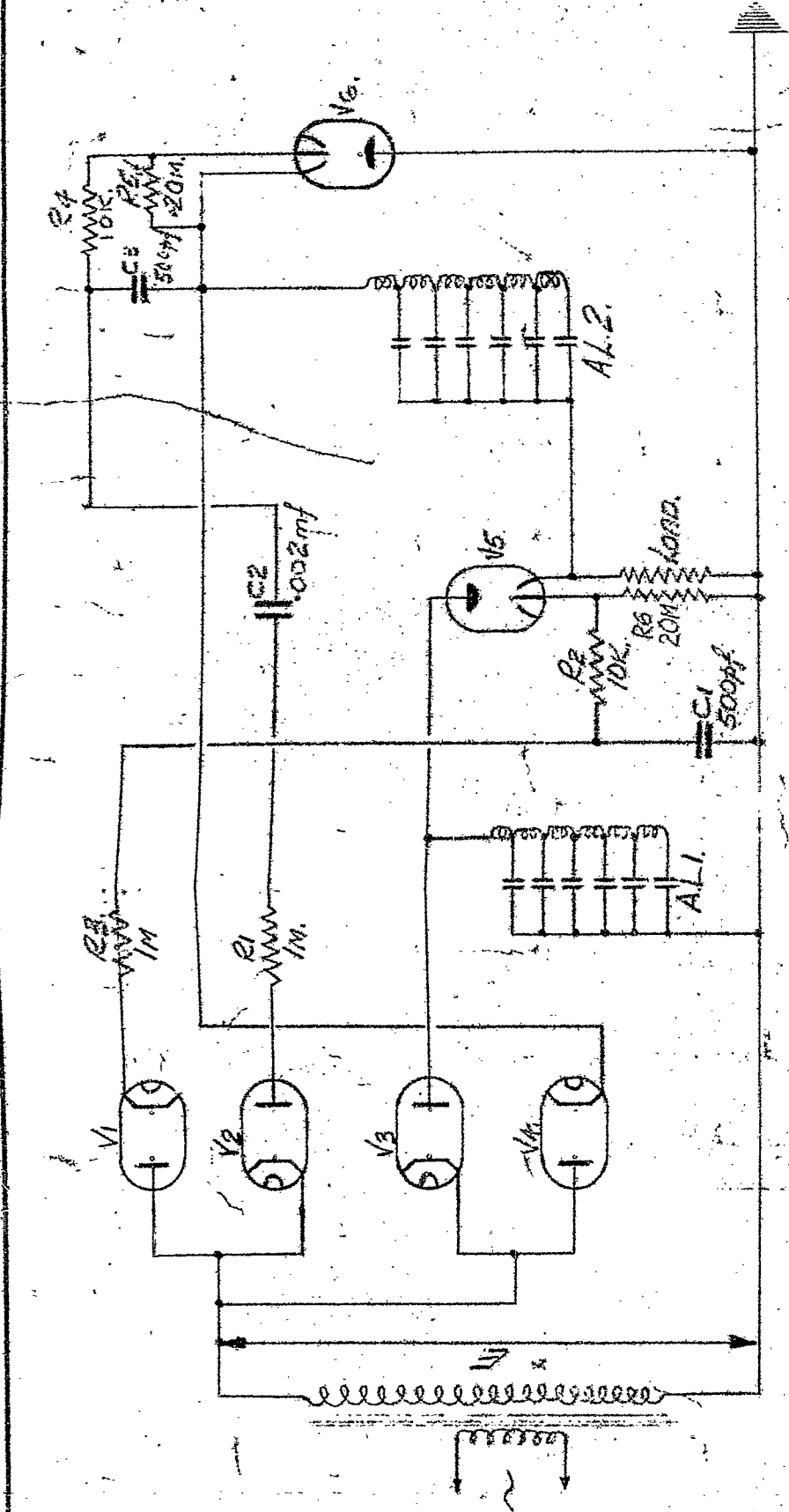
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ONE	8-24					TRACED	1
						CHECKED	2/75
						APPROD	2/75

DIAGRAM NO

A.T.R. 70/775



ITEM	DESCRIPTION AND AM. REF.	VALUE	RATING	TOL.
R1	1M	1M		
R2	10K	10K		
R3	1M	1M		
R4	20M	20M		
R5	20M	20M		
C1	500pF	500pF		
C2	100pF	100pF		
C3	500pF	500pF		
V1	VIIII			
V2				
V3				
V4				
V5				
V6				
AL1	157WAX			
AL2	"			



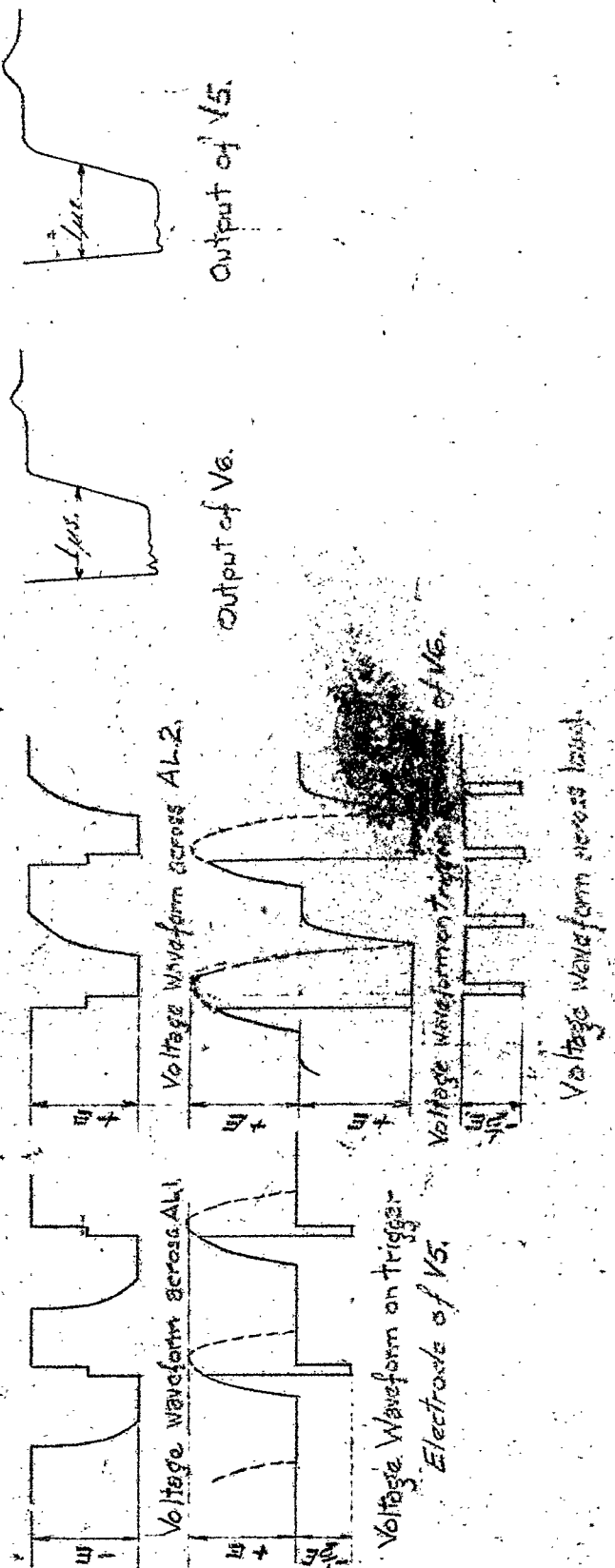
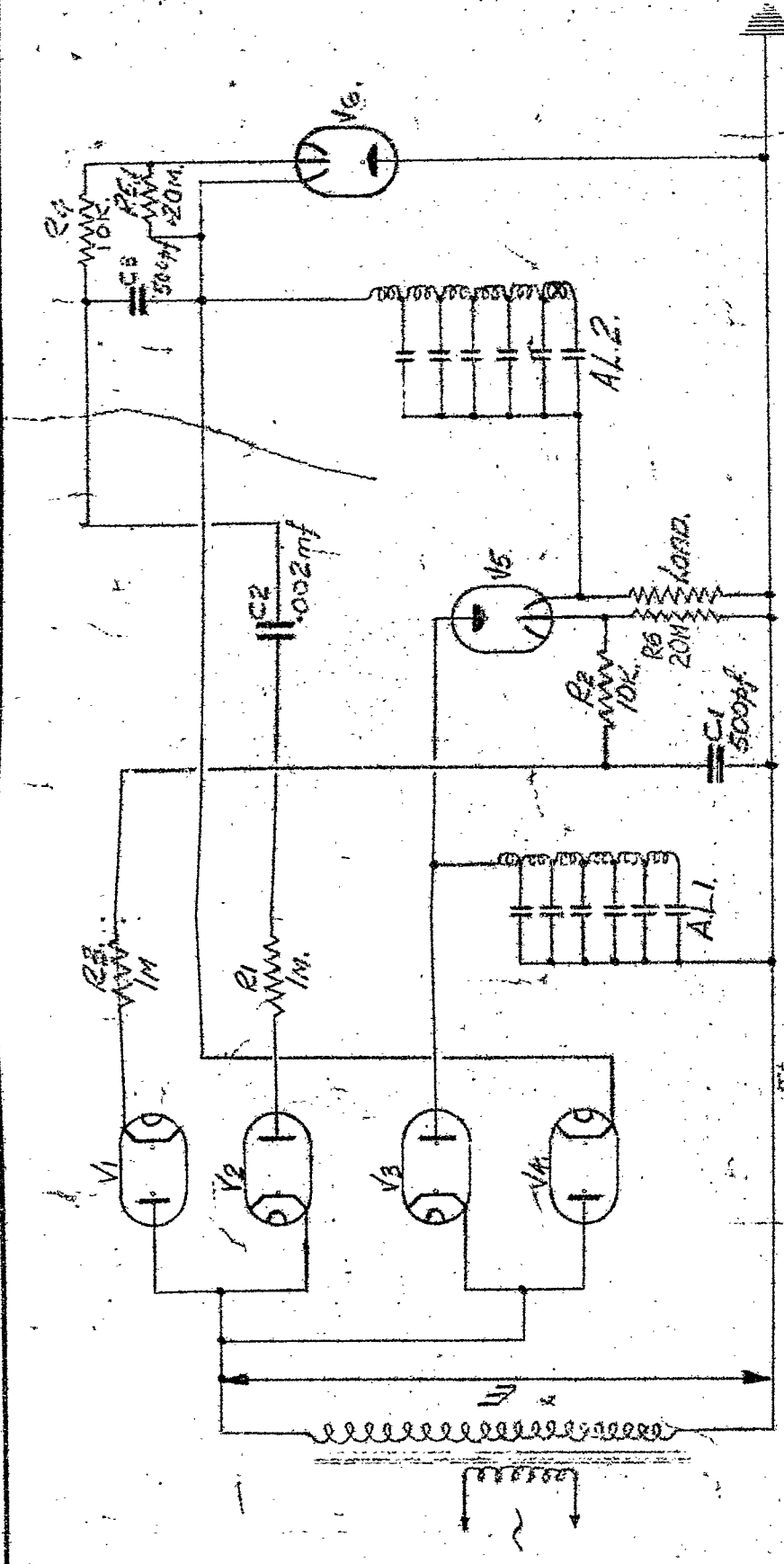
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TRE. MAP	DIAGRAM NO.
G.T.R. 70/214	



QTY	REF.	DESCRIPTION AND A.M. REF.	VALUE	RATING	TOL.
1	R1	10K	10K		
1	R2	10K	10K		
1	R3	10K	10K		
1	R4	10K	10K		
1	R5	10K	10K		
1	R6	10K	10K		
1	R7	10K	10K		
1	R8	10K	10K		
1	R9	10K	10K		
1	R10	10K	10K		
1	R11	10K	10K		
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1	R98	10K	10K		
1	R99	10K	10K		
1	R100	10K	10K		



TRE. MAP		DIAGRAM NO.	
TITLE: SIMPLE TRIGGERED SPARK GAP MODULATOR, FULL WAVE CIRC. MS.		G.T.R. 70/8/54	
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